WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

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Space-Age "Slippage" -- Who's to Blame?

New details being turned up by Congressional investigators demonstrate this week how programs considered essential have been allowed to "slip" or falter solely on the basis of financial cutbacks or indecision. The evidence:

F-I Engine -- This huge engine, which may be the first to put an American on the Moon, is now delayed by as much as 18 months, according to an admission by NASA officials to the House Space Committee. The reason? NASA appropriations were reduced slightly last year and it was decided that an average of $500,000 a month could be saved over a one-year period. The possible result? The money will eventually be spent but the hold-back decision only delays the day when the U.S. will be able to visit Soviet facilities on the Moon.

Saturn -- The Administration now presses for many millions in additional funds for this 1½ million pound thrust space booster, which is expected to be used for landing instrument payloads on the moon, launching 24-hour communication satellites and large manned orbital space stations. Evidence turned up by House Investigators this week shows that a sudden decision in June, 1959 calling for a "considerable reduction in funds" will "necessitate changes in payloads, missions, reduction of components testing and extension of the test period, and slippage in firing schedules."

Project Rover -- Evidence turned up by the Joint Committee on Atomic Energy indicates plainly how indecision and fiscal troubles have delayed the status and prospects of the Nation's nuclear rocket project. Here is the Committee's own facts and figures:

	Original	1957	Current
Engine Ground Test Feasibility Target	1960	1963	1964
Target for Flight Test of Rocket	1965	1968	1967-1969

Original AEC Request for Construction Funding: $20 million in 1961
Budget Bureau Request for Construction Funding: $13 million in 1961-1962

Original AEC request for Operating Funds, 1961: $22.8 million.
Budget Bureau request for Operating Funds, 1961: $18 million. An AEC appeal for further funds has subsequently been denied.

Space Structures Research

Here are highlights of National Aeronautics and Space Administration research programs in the fields of space structures and materials as outlined by Richard V. Rhode, Assistant Director, NASA:

* Puncture-Experiment satellite is planned for launching with a Scout booster later this year to test theories and laboratory results on prevention of meteoroid damage in space. Satellite will have short tubes running lengthwise, made of metal of various thicknesses and containing gas under pressure. Tube puncture by a meteoroid will cause gas to leak out, giving an indication of frequency and severity of hits.

  Low-Density Glass-Wool has been shown in laboratory tests to be a possible material for space structures. Placed between two metal sheets, experiments have demonstrated the material will stop meteoroids of 1/16 inch diameter at speeds of about 40,000 miles per hour.

* Lunar instrument landing studies indicate that a so-called "gas-bag" cushion offers many potential advantages in simplicity and reliability, particularly for smaller lunar payloads. Studies indicate that a retro-rocket landing system permits a soft or easy landing, even in the absence of a lunar atmosphere and is the kind of system that will have to be used to place a man or men safely on the moon. However, the system is complex and heavy and requires additional research in such fields as stabilization and control, guidance and throttleable rockets.

  Shock-Absorbing systems under study include a crushable-structure concept employing light weight metal in honeycomb-type construction. A penetration spike system is also under consideration because of its simplicity. However, studies indicate that it will work properly only if the lunar surface is neither too hard nor too soft. Advance knowledge of the lunar terrain and proper orientation with respect to the impacted surface are two requirements which may offer disadvantages for such systems.

  Gas Cushion system, which does not have these limitations, may therefore be the simplest alternative, although requiring more research to understand design. In one proposed system, the instrument package is suspended in the center by many radial cords. The system would be expected to fall freely upon ejection in the Lunar gravity field because there is no atmosphere.

  Upon impact the cushion compresses until the instrument package is brought to rest on the impacted surface. At this instant, the bag is split to avoid rebound. Energy is absorbed by compression of the gas, by shock waves generated in the gas, and by distortion of the bag skin.

  It is thought that gas cushions suitable for landing instrument packages on the moon might range between 5 and 25 feet or more in diameter, depending on the orbital height and size and weight of the instrument package. At higher payload weights the retro-rocket system may be superior, although the gas cushion might still be used because of its greater simplicity and reliability.

Intermittent Action Camera

A recording system that simultaneously photographs randomly occuring events displayed on an oscilloscope, and the precise time of each event, has been developed by the National Bureau of Standards.

Film consumption is said to be reduced drastically by the device, since a picture is taken only when the camera is triggered by the event to be photographed. Accuracy is said to be within a few microseconds. Framing cycle can be completed in seven milliseconds.

A high speed clutch actuation mechanism similar to a large electrodynamic speaker is said to make possible the rapid framing rate. The clutch is located between the film drive and continuously revolving flywheel. When a pulse triggered by the signal is applied to the clutch part corresponding to the voice coil, a cone is driven into engagement with the flywheel and rotates a small drum in contact with the film.

Time of the event is displayed by an array of small neon bulbs that indicate, in a binary fashion, numbers that correspond to the hour and date. Device has been used to record and study the electromagnetic radiation from lightning strokes (sferics) that is propagated over long distances. However, the device and its components are expected to have other applications in which intermittent, random events must be recorded.

Research Symposium

Officials of a number of Government research agencies are cooperating in the Fifth Institute on Research and Development Administration to be held at American University, Washington, D. C., April 25-29. Program features lectures and discussions, small workshop sessions, field trips and special reading. It is intended for those engaged in supervision or administration of scientific research and development.

(For Details write Lowell H. Hattery, The American University, 1901 F Street, N.W., Washington, 6, D.C.)

Science Attache Program

State Department's long-delayed program for appointment of overseas Science officers is now moving more rapidly. New appointments include,Ernest Watson,California Inst. of Technology, New Delhi;Neal Weber, Professor of Zoology, Swarthmore, Buenos Aires; Harry M. Wells, Chmn. Upper Atmosphere Section, Carnegie Institution, Rio; John B. Bateman, Army Chemical Corps, Deputy Science Officer, London; William Littlewood, Navy Hydrographic Office, Deputy Science Officer, Stockholm; David C. Rife, Former Professor of Zoology, Ohio State University, Deputy Science Officer, New Delhi and Marshall Crouch, Case Institute, Deputy Science Officer for Tokyo. Dr. Crouch began his term last year.

* NATO Fellowship Program

U.S. citizens with a doctoral degree or equivalent experience may be eligible for approximately 40 NATO fellowships designed to encourage further study in the sciences abroad. Awards will be made in the mathematical, physical, and engineering sciences and certain life and social sciences.

(For details and application form write Fellowship Office, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington 25, D.C. Deadline for applications is April 11, 1960)

* Second Generation Polaris

The Navy, riding high on the basis of recent Polaris test firings, is now planning a second-generation version to incorporate longer range, greater accuracy and other imporvements It is by no means certain that Lockheed Aircraft Corp., which has won high Navy plaudits as Polaris Prime Contractor, will handle the second-generation version.

* Photogrammetric Surveys

Bureau of Land Management, U.S. Department of the Interior has demonstrated that water boundaries can be determined accurately by photogrammetric methods, and at a considerable savings. In a limited test along the Snake River in Idaho this system cost an average of $84 per mile, compared to $146 by ordinary ground methods.

* Saline Water Conversion Research

U.S. Office of Saline Water believes that more fundamental research is required for the conversion of salty or brackish water to fresh. Among requirements are exploratory research on scale deposition on heated surfaces, electrical control of adsorptivity, improved membranes, and ion-retardation resins. Such studies will be continued next year. Research is "urgently needed" on the use of gas hydrates, an electrolytic system for demineralization, deposition of salts in electrodialysis, improved ion-restraining membranes, polarization, effect of acoustic vibrations on heat transfer rates, corrosion of materials in hot sea water, chelation, pretreatment of water to prevent scaling and corrosion.

* Mercury Battery Warning

Atomic Energy Commission is warning that mercury and certain nickel-cadmium batteries may explode when shorted. In one case a small 10.7 volt battery began to "hiss," exploded and landed 75 feet away. (For further information write Safety and Fire Protection Branch, Office of Health and Safety, U.S. Atomic Energy Commission, Washington 25, D.C. Ask for Accident Report No. 156)

* Nuclear Tests and Radio Noise

"Teak" and "Orange" high altitude explosions over Johnston Island in the Pacific last year had a pronounced effect on radio noise in the Pacific according to new National Bureau of Standards studies. An hour following such a blast noise decreased by as much as 32 decibels at some frequencies. Recovery apparently occurred in a matter of hours at 13 kc and 5Mc, but from 51kc through 2.5 Mc a changed pattern was evident for several days. It is theorized that a highly ionized region was formed which caused greatly increased ionospheric absorption.

Research Checklist

( ) Ice Cover Measurements: Army has devised a "radio yardstick" method for measuring thickness of polar ice, which may replace the conventional, time-consuming and relatively expensive seismic sounding technique. Modified 10-watt aircraft type radio altimeter is mounted on a tracked carrier. Special directional antennas for transmitting and receiving signals are positioned to remain four feet above the ice surface. Depth is determined by measuring the time required for transmitted signals to pass through the ice, reflect off the hidden ground beneath and return. The slower velocity of radio signals moving through polar ice is taken into account. Findings also offer a warning to polar fliers since pulses from their altimeters may penetrate the ice and give "dangerously deceptive readings."

(R&D by Amory H. Waite, U.S. Army Signal Research and Development Laboratory, Ft. Monmouth, N.J.)

( ) Electronic Detonator: A detonator which requires no primary explosives and operates on minute amounts of current has been developed and tested for the Army Ordnance Corps. Current is channeled through a small, well-confined column of the explosive mixed with a special carbon. Burning is amplified along the core of the detonator until enough pressure builds up to rupture a brass disk. Fragments of this disk, flung across an air gap, are said to acquire velocities high enough to cause true detonation in a second confined column of the high explosive. Safety is said to be provided through immunity to friction, impact and fire, and spurious electrical currents. Applications are expected in self-destruction systems, explosive bolts, stage separation mechanisms and explosive detonators in missiles and rockets.

(R&D by Explosive Research Section, Armour Research Foundation, Chicago 16, Ill., for Picatinny Arsenal, U.S. Army Ordnance)

( ) Temperature Control Device: A simple method of achieving stable temperature control over a large range of temperatures is said to have been developed by the National Bureau of Standards. A resistance diode bridge circuit replaces the conventional ac bridge in a temperature controller which had previously given irregular performance when error exceeded a certain critical value.

(Report of October 1959 now available. 4 pages. 50 cents. Write OTS, U.S. Department of Commerce for NBS Technical Note No. 34)

( ) Missile Model Testing Device: Cellophane tape has replaced movie film as a base for a strip of aluminum foil used by the Navy in connection with hypersonic tunnel testing of missile models. The taped foil is perforated and enclosed in gas-filled chambers where it is connected to a grounding rod. When the energy in a capacitor is released to the circuit the resulting high current instantly shoots through the foil, burning out the thin perforation points. Because the current is high, sparks gap each of the points uniformly -- igniting the combustible gases throughout the chamber. The taped foil is consumed, a diaphragm is ruptured and the gas becomes a hypersonic airstream. The adhesive tape solves problems of cementing the delicate foil, and leaves no residue after burning, a difficult problem in the past.

(R&D by Hydrophone Section, Electrical Evaluation group, U. S. Naval Ordnance Laboratory, White Oak, Md.

Publication Checklist

( ) Post Office Appropriations, a transcript of testimony by postal Officials including much background information on the Department's research and development program. 438 pages. Single copies free. (Write Committee on Appropriations, House of Representatives, The Capitol, Washington 25, D.C. for Hearings - Post Office Department, Fiscal 1961)

( ) Solar Stills, an account of research and experimental work by the Franklin Institute on means of producing water-wettable surfaces on plastic films for condensing surfaces on solar stills. Studies were connected with saline water conversion program. 75 cents. (Write OTS, U.S. Department of Commerce for Saline Water Progress Report No. 29)

( ) Ball Bearing Steels, a study of the tension, compression and fatigue properties of several "hot-work" steels used for high temperature ball-bearings. 48 pages. Single copies free. (Write National Aeronautics and Space Administration, 1520 H Street, N.W. Attn: Code BID for NASA Technical Note D-239)

( ) Flocculation, an account of studies performed by the University of Washington on filtration of coal slurry by flocculation. 22 pages. Single copies free. (Write Publications Distribution Section, U.S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa. for Report of Investigation No. 5535)

( ) Molten Carbonates, a bibliography and technical literature review by Rensselaer Polytechnic Institute for the Navy on Lithium, Sodium and Potassium Carbonates. A 1958 Report now available. 62 pages. $2. (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 991)

( ) Atomic Raw Material Techniques, a review of the present state of knowledge about the exploration and evaluation of uranium and thorium deposits. $1. (Write International Atomic Energy Agency, Documents Service/Publications Sales Unit, Vienna I, Austria for "Surveying and Evaluating Radioactive Deposits")

( ) Electronics Marketing, a survey of present and future marketing of U.S. electron tubes and semiconductors in nine major European nations. Prepared by the U.S. Department of Commerce. 25 cents. (Order "Electron Tubes and Semiconductors" from Superintendent of Documents, Government Printing Office, Washington 25, D.C.)

( ) Mechanical Drafting and Design Technology, describes jobs and training requirements for these technician-level occupations. May be useful in developing training courses. 26 pages. Single copies free. (Write Publications Office, U.S. Office of Education, Washington 25, D.C. for Report OE 80000, Misc. 3570-1)

( ) R&D - Non-Profit Institutions, a brief report covering the year 1957 on research and development by non-profit institutes, federal contract research centers and professional and technical societies. 4 pages. Single copies free. (Write Information Office, National Science Foundation, Washington 25, D.C. for a copy of Publication NSF-60-7)